

Defining and Refining the Critical Period of Weed Control for Soybeans in Manitoba

The critical period to control weeds to avoid yield loss in soybeans was shortened significantly by planting regionally competitive varieties at narrow row widths and higher plant populations. The weed-free period ended on average between V2 to V4, but ranged from VE to R1.

THE CRITICAL PERIOD of weed control (CPWC) is the period of time a crop must remain free from weeds to prevent yield loss. Defining this period for soybeans in Manitoba allows farmers to ensure that only in-crop herbicide applications that are necessary are applied, making soybean production more profitable.

OBJECTIVE 1: DEFINE THE CPWC

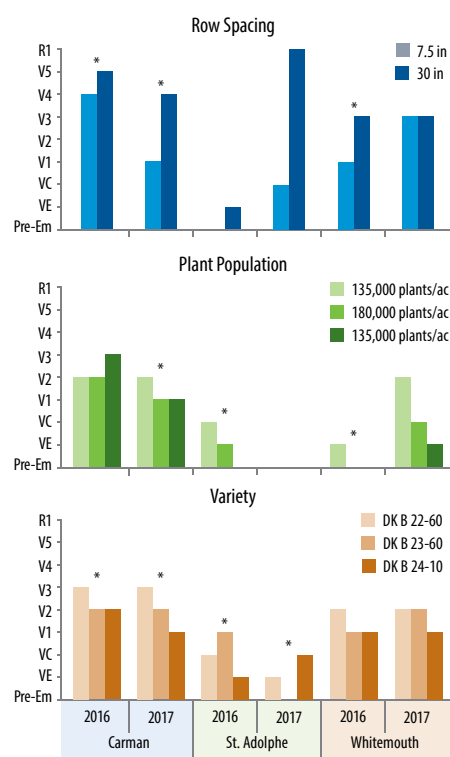
First, to determine the critical time of weed removal at the beginning of the CPWC, soybeans were kept weedy for specific lengths of time. Once weed control began, plots were kept weed-free. This determined when the weeds emerging with the crop began to cause yield loss and needed to be controlled.

In a second experiment, the critical weed-free period defines the end of the CPWC. Here, plots were kept weed-free for increasing periods of time after planting to determine at which stage weeds no longer caused yield loss. Beyond this point, an in-crop herbicide was no longer necessary.

Determining the start of the CPWC proved challenging in farm fields. Due to low, inconsistent weed pressure, resulting low yield losses made it difficult to mathematically establish a clear beginning.

The average end of the CPWC was between V2 and V4. Overall, the end of the CPWC ranged between VE and R1 (Figure 1). This means at some sites, under low weed pressure, an in-crop herbicide was not necessary, while at others under high weed pressure, the crop needed to remain free from weeds until R1. Different soil characteristics, environmental conditions and weed populations help explain the wide range in the end of the CPWC.

Figure 1. End of the critical weed-free period for soybeans in Manitoba for three experiments with an acceptable yield loss threshold of 5%. Unless stated otherwise, DKB 23-60 was grown at 180,000 plants/ac on 15" rows.



*Indicates site-years where the treatment effect was significant at $p < 0.05$.

OBJECTIVE 2: SHORTEN THE CPWC

This experiment determined if elements of an integrated weed management approach could improve soybean competitive ability and shorten the length of time soybeans must remain weed-free. Specific management tools evaluated included variety, row spacing and plant population.

In general, the CPWC ended one to three stages earlier in narrow-row than wide-row soybean production (Figure 1). Planting soybeans in narrow rows created a more competitive crop that consistently shortened the CPWC, especially under high weed pressure.

Adjusting plant populations was another cultural management practice that reduced the length of time soybeans must be kept weed-free. This tool was most effective under low to moderate weed pressure. Reducing plant populations to 135,000 plants/ac lengthened the CPWC by one growth stage. Increasing plant populations to 270,000 plants/ac did not shorten the end of the CPWC, but this provided yield stability when weed pressure was high.

The influence of soybean variety on the end of the CPWC was site-specific, but consistent across years. This indicated that the ability of soybean varieties to compete with and perform under weed pressure was region-specific.

Integrating these weed management tools as standard soybean production practices will reduce the need for multiple in-crop herbicide applications, lowering production costs. This greatly reduces the risk for developing herbicide-resistant weeds, especially glyphosate-resistant weeds that have become prominent in more established soybean growing areas.

Further research is needed to refine the CPWC across Manitoba for a broader range of weed species and densities. Other weed management strategies, such as planting dates and soil fertility, could further influence the competitive ability of soybeans and should be considered. ▀